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Environmental considerations in the organizational context: A pathway to pro-environmental behaviour at work



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ABSTRACT

Encouraging pro-environmental behaviour at work can result in a significant reduction in environmental problems. Research revealed that general environmental considerations such as biospheric values and environmental self-identity are important antecedents of private pro-environmental behaviour. Yet, the question remains whether such general environmental considerations also predict pro-environmental behaviour at work. We propose a parsimonious theoretical model (the VIP-model) in which biospheric values affect personal norms to behave pro-environmentally at work and pro-environmental actions via the environmental self-identity. A study involving a diverse sample of employees from different European organizations supported the VIP-model, showing that biospheric values and environmental self-identity influence personal norms, and that stronger personal norms encouraged various self-reported pro-environmental behaviours at work to some extent. The VIP-model yields promising, cost-efficient strategies to encourage pro-environmental behaviour at work.

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1. Introduction

Human behaviour causes many environmental problems due to greenhouse gas emissions, pollution and the use of natural resources, raw materials and energy [21,48]. These environmental problems are partly caused by environmental behaviour, which refers to any behaviour that has an impact on the environment, both good and bad [52,53]. Much research has been conducted on understanding and encouraging pro-environmental behaviour, that is, behaviour that harms the environment as little as possible or even benefits it [52]. Until now, most studies focused on factors influencing private or household pro-environmental behaviour [4,44,53]. Yet, within a lifetime people spend a major part of their time at work, and encouraging pro-environmental behaviour at the workplace or within organizations can result in a significant reduction in environmental problems [9,10,12,14]. For example, workers

can use less office supplies, recycle at work, they may make business trips by public transport instead of by car or even arrange virtual meetings, or they may turn off lights, the heating or appliances when no one is in the office. How can we encourage such pro-environmental behaviour at work? Although studies on private and household pro-environmental behaviour yielded important insights in factors encouraging pro-environmental behaviour, the question remains whether results of these studies can be generalized to pro-environmental behaviour in the organizational context.

Importantly, pro-environmental behaviour is often more costly for the actor (e.g., in the sense of money, time or effort) in the short term, than behavioural alternatives that are more harmful for the environment [60]. So, people oftentimes need to incur some personal costs to benefit the environment [44]. Research on private pro-environmental behaviour has shown that many people are willing and intrinsically motivated to engage in pro-environmental behaviours at home, even though this is somewhat costly [2,19,44]. General environmental considerations that make people focus on doing “the right thing” for the environment, appeared to play an important role in this respect [22,44,48,53,52]. Notably, research on pro-environmental behaviour in the private sphere shows that two conceptually distinct but related types of

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general environmental considerations motivate people to engage in a range of pro-environmental behaviours: biospheric values (e.g. [17,28,49]) and environmental self-identity (e.g. [34,56,58,59,62]); we will elaborate on these in the next section. If biospheric values and environmental self-identity are indeed generic predictors of environmental behaviour, we would expect that they influence behaviours at work in a similar way and via similar processes as behaviour at home. Hence, an important question is: are such general environmental considerations relevant for understanding environmental behaviour in the organizational context as well?

In the present paper we will examine to what extent and via which processes biospheric values and environmental self-identity affect environmental behaviour at work. Below, we propose and test a novel parsimonious theoretical model for explaining how general environmental considerations, in particular biospheric values and environmental self-identity, predict environmental behaviour at work, building on research on pro-environmental behaviour in the private sphere.

1.1. The Value-Identity-Personal norms (VIP) model

Many studies revealed that values play an important role in explaining pro-environmental beliefs, norms and behaviour in the private sphere (see Refs. [20,46] for reviews). Values are defined as general desirable trans-situational goals varying in importance, which serve as a guiding principle in people's life [42]. Values are abstract and general and remain relatively stable over time [50], and as such, are likely to affect a wide range of different beliefs, norms and behaviours. Especially biospheric values have proven to be important and consistent predictor for understanding and explaining environmental behaviour: people are more likely to engage in various pro-environmental behaviours when they strongly endorse biospheric values (e.g. [17,28]; see Ref. [46] for a review). People with strong biospheric values particularly consider the consequences of their behaviour for the quality of nature and the environment, and strongly base their decisions on how these will affect the costs and benefits for the ecosystem and biosphere as a whole [44].

Because values are abstract and general, they mainly predict environmental behaviour indirectly. One important route through which biospheric values promote pro-environmental behaviour may be via environmental self-identity. Environmental self-identity reflects the extent to which an individual sees himself or herself as a type of person who acts pro-environmentally and prescribes a course of action that is compatible with this sense of how the individual sees himself or herself [58]. Research on environmental behaviour in the private sphere has shown that people with strong biospheric values are more likely to see themselves as a person who acts pro-environmentally [34,57,58]. Yet, there is only initial evidence that environmental self-identity mediates the effect of biospheric values on pro-environmental behaviour [58].

The next question is: why are people motivated to act in line with their environmental self-identity? Initial research on environmental behaviour in the private sphere revealed that environmental self-identity affects pro-environmental behaviour by strengthening personal norms to act pro-environmentally [56]. Personal norms reflect self-expectations and are experienced as feelings of moral obligation to engage in the relevant behaviour [41]. Individuals with strong personal norms to act pro-environmentally feel morally obliged to behave accordingly [40,56]. Personal norms can be general, for example the personal norm to engage in pro-environmental behaviour in general, or more specific, for example the personal norm to recycle [13]. Studies revealed that strong general as well as specific environmental personal norms indeed encourage many different pro-environmental behaviours, such as turning off the tap while brushing one's teeth

[27], willingness to pay higher prices for environmentally friendly food [61], intention to participate in actions to reduce emissions of particulate matters [45], reductions in car use [37], as well as pro-environmental actions in general (e.g. [36,56]). Yet, personal norms are not always very predictive of behaviour. In general, it seems that people are most likely to act upon their feelings of moral obligation when this behaviour is not too costly and when they do not perceive significant barriers for doing so [5,48]. It seems that people are willing to incur some personal costs and act upon their personal norms in order to do the right thing such as protecting the environment, but if the context seriously constrains such behaviours, in the sense that the setting does inhibit such behaviours or the behavioural costs are too high, individuals may not act upon their personal norms (see Ref. [52], for a review).

On the basis of the above, we suggest that biospheric values influence environmental self-identity, which in turn strengthens personal norms to act pro-environmentally, eventually influencing (the likelihood of) a wide range of environmental behaviours, not only in the private sphere, but also at work. More specifically, we propose the Value-Identity-Personal norms (VIP) model to explain how general environmental considerations (biospheric values and environmental self-identity) predict pro-environmental behaviour at work, in which biospheric values (V) affect the strength of the environmental self-identity (I), which influences personal norms to behave pro-environmentally at work (P) and ultimately pro-environmental behaviour at work (see Fig. 1). The research above provided fragmented evidence for the relationships between values, environmental self-identity, and personal norms affecting environmental behaviour, that is, previous studies have tested parts of the VIP-model only. In this paper, we aim to examine the predictive power of the full VIP-model, for the first time. Notably, we test the VIP-model in the organizational context.

1.2. The VIP-model predicting pro-environmental behaviour at work

Biospheric values and environmental self-identity are general environmental considerations that are not focused on a particular domain or context. Although research revealed that biospheric values and environmental self-identity predicted a wide range of pro-environmental beliefs, norms, intentions and behaviours at home [44], it is as yet not clear whether they also predict pro-environmental behaviour in a different context, notably at work. On the one hand we could argue that strong biospheric values and a strong environmental self-identity would strengthen feelings of moral obligations to behave pro-environmentally in different contexts, including pro-environmental behaviour at work. On the other hand, however, different processes may play a role in the workplace. For example, employees may not translate their biospheric values and environmental self-identity into personal norms at work, and hence they may not feel morally obliged to act pro-environmentally within the organizational context, because they feel behaving pro-environmentally at work is not within their control or their personal responsibility [39]. Current practices indeed suggest that it is generally believed that individuals do not feel morally obliged to behave pro-environmentally at work. For example, many organizations employ external incentives and sanctions to encourage pro-environmental behaviour at work (e.g., penalties for not conforming to strict printing policies, reimbursing travel cost only when employees use pro-environmental means of transport), which suggests that they do not trust that employees are likely to behave in such a manner otherwise [18,25,53]. Yet, the enforcement of such sanctions can be difficult, reducing their effectiveness. Consistent enforcement of sanctions may even not be possible in many situations. Therefore, it is important to find out whether employees may feel morally obligated to behave pro-

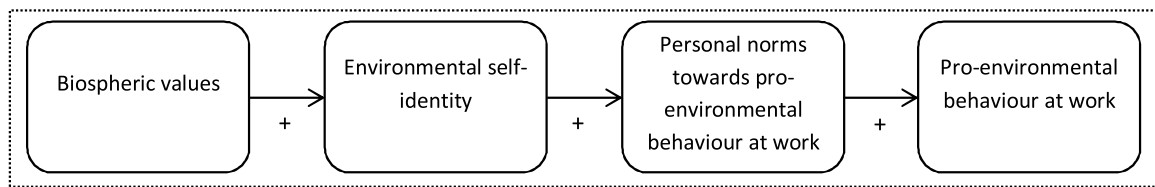


Fig. 1. Values-Identity-Personal norms (VIP) model to explain how environmental considerations predict pro-environmental behaviour at work.

environmentally at work and act upon their biospheric values and environmental self-identity at work [10,38,51]. If workers would feel morally obliged to behave pro-environmentally at work, and if we understand how such feelings of moral obligation can be strengthened, we would be able to develop novel and cost-efficient ways to promote pro-environmental behaviour at work, in which case little or no external incentives (e.g. financial rewards or sanctions) are needed. We assume that strong biospheric values and a strong environmental self-identity will result in stronger personal norms to act pro-environmentally at work.

Yet, even when people feel morally obliged to behave pro-environmentally at work, the next important question is if this personal norm is translated into actual pro-environmental behaviour at work. As indicated above, research on private-sphere pro-environmental behaviour suggests that personal norms are particularly predictive of pro-environmental behaviour when the context does not seriously inhibit such behaviours, in the sense that the setting allows such behaviours and the behavioural costs are not too high. What does this reasoning imply for pro-environmental behaviour at the workplace? On the one hand, we could argue that (at least) some pro-environmental behaviours at work are not very costly and within workers' control (e.g., switching off the lights or computer when leaving the office), which suggests that personal norms can predict pro-environmental behaviour at work as well. On the other hand, workers may feel that they have little control over their environmental impact at work because many things are externally regulated and controlled (e.g., automatic air-conditioning, heating and lighting systems). Also, employees may experience conflicting interests at work and face significant barriers to act upon their personal norms in the organizational context [31,54]. For example, employees may be subordinate to the goal of the production process in their behavioural decisions and therefore be less able to behave according to their personal norms when these are in conflict with goals of the work process, such as driving a car for delivery work [55]. Hence, strong personal norms to behave pro-environmentally at work may not necessarily translate into actual pro-environmental actions at work as workers may face different barriers to do so (e.g. they may not feel able to recycle because there are no recycling bins in their office). Therefore, we aim to test the predictive power of the VIP-model in the work context and particularly explore to what extent general environmental considerations (i.e., biospheric values and environmental self-identity) also strengthen personal norms and different types of pro-environmental behaviour at work.

The VIP-model builds on prominent theories and models in environmental psychology that aim to explain and predict pro-environmental behaviour, such as the theory of planned behaviour (TPB, [3]), the norm activation model (NAM, [41,43]), and the value-belief-norm theory of environmentalism (VBN theory, [50]). Yet, the VIP-model differs from these theories and models in some important ways. The TPB (see also Refs. [16,25]) suggests that behaviour is based on rational considerations, in which people weigh costs and benefits of behavioural options. Unlike the VIP-model, NAM, and VBN theory, TPB does not emphasise the role of moral considerations. In contrast to what the TPB proposes, the VIP-model leaves the possibility open that the process that leads to

pro-environmental behaviour at work is unconscious and not deliberate, while particularly the TPB argues that pro-environmental behaviour results from reasoned processes.

Compared to the NAM and VBN-theory, the VIP-model is more parsimonious and contains mostly general predictors. The NAM and VBN theory propose, like the VIP-model, that people are more likely to engage in pro-environmental behaviour when they experience a personal norm to do so. The NAM and VBN theory propose that personal norms depend in turn on specific beliefs, notably awareness of the environmental consequences of a specific behaviour (such as car use) and feeling responsible for these problems and their solution. VBN additionally proposes that awareness of consequences depends on worldviews (in particular the New Environmental Paradigm, reflecting people's view on the relationship between human and nature) and the values people endorse. In this respect, the VIP-model is more parsimonious, and proposes that personal norms depend on values and environmental self-identity, respectively. Biospheric values and environmental self-identity reflect general environmental considerations. Such general predictors may be less strongly related to specific behaviours than behaviour specific beliefs, but they are more likely to predict a range of environmental behaviours [56].

1.3. The present study

In the present study we will test if the general environmental considerations (i.e., biospheric values and environmental self-identity) included in the VIP-model (see Fig. 1) indeed predict personal norms and environmental behaviour at work. We hypothesize that in the organizational context, biospheric values will positively influence environmental self-identity, that is, the extent to which people see themselves as the kind of person who acts pro-environmentally. We hypothesize that environmental self-identity in turn will affect personal norms to behave pro-environmentally at work, thus a feeling of moral obligation to behave pro-environmentally at work. Moreover, we hypothesize that biospheric values influence personal norms to behave pro-environmentally at work via environmental self-identity, similar to personal norms related to private-sphere pro-environmental behaviour (see Ref. [58]). Next, we explore the extent to which personal norms predict different types of environmental behaviour at work; that is behaviours related to energy use at the workplace, energy use related to transport, waste prevention and recycling. We tested our model via a questionnaire study. To assess the generalizability of our reasoning, we tested our model and the hypothesized relationships with a sample of employees taken from different organizations in different European countries.

2. Method

2.1. Participants and procedure

A questionnaire study was conducted among employees of four large-scale organizations in Europe, including two state organizations (a municipality in the Netherlands and a university in Spain), and two service providers in the field of natural resources (a public

water and wastewater service provider in Romania and an energy supplier in Italy). We selected these different large-scale organizations, because such organizations are responsible for a significant amount of greenhouse gas emissions through the organization of their production processes, hold a high potential for change and could provide us with relatively large samples of participants compared to smaller organizations. The selected organizations are all in different ways and to a different extent involved in promoting pro-environmental behaviour at work. For example, the municipality in the Netherlands aims for a clean, liveable city which is 'energy neutral' by the year 2025, the university in Spain develops research on the environment and sustainable development, the public water and wastewater service provider in Romania has implemented an integrated quality, environmental, and occupational health and safety management system, and the energy supplier in Italy promotes the market for solar products.

To ensure that the sample was representative of the organization, respondents were selected randomly at all levels of the organizations. In total, 618 ($N=117$ in the Netherlands, $N=255$ in Spain, $N=122$ in Romania, $N=124$ in Italy) respondents completed the study, of which 51% were men and 49% were women, varying in age from 16 to 66 years old ($M=43.5$, $SD=10.05$). In our sample, we only included responses that had completed the full values scale (the first construct we measured) and for the specific analysis we only included responses that had completed scales on the specific constructs that were part of the specific analysis. To maximize responsiveness and ensure a varied sample, we made sure that employees had easy access to the questionnaire; the questionnaire was either administered online (607 participants) or on paper (11 participants). The paper version had the exact same layout, but only in print instead of online. For the online version, participants received an e-mail from a staff member of their organization (our contact person) with an invitation to complete an online study which is part of a project funded by the European Union and aims to understand which factors affect pro-environmental behaviour at work. They could access the study via a link, where instructions of how to complete the study were provided. Also, an email address was provided to contact for any questions. We conducted the analyses with and without the participants who received the paper version of the questionnaire, and found the same pattern of results. Therefore we will present the results from the whole sample throughout this paper.

To construct our questionnaire, and more specifically to construct our measure for environmental behaviour, we conducted 4 short interviews with our contact persons in the four case study organizations: a senior staff member on sustainability at the Municipality of Groningen, head of the office for the environment of the University of A Coruña, two members of HR Integration and Development of Enel Green Power, and a HR Specialist of Aquatim. These short interviews were conducted prior to the questionnaire study and aimed to identify environmental behaviours over which employees would have some control. In the questionnaire, participants first answered some general questions. Then we measured biospheric values, which was followed by the randomized items for environmental self-identity and personal norms to behave pro-environmentally at work. The questionnaire finished with our measure of environmental behaviour at work. Next, after the questionnaire study we conducted 22 semi-structured interviews with employees at different levels of the four case study organizations (i.e., actors at different levels in the organization that are likely to have different views and perspectives on the issues at stake, so not (only) key decision makers). These semi-structured interviews were used to explain surprising results and to deepen the theoretical explanations. The data were collected from June 2012 until December 2012.

2.2. Measures

2.2.1. Biospheric values

We measured the strength of biospheric values by using a validated 16-item value scale aimed to measure biospheric, altruistic, egoistic and hedonic values [47]. Participants rated the importance of each value as a guiding principle in their life on a scale from -1 (opposed to my values) to 7 (of supreme importance). Biospheric values were represented by 4 items (Respecting the earth: harmony with other species; Unity with nature: fitting into nature; Protecting the environment: preserving nature; Preventing pollution: protecting natural resources). The biospheric values scale showed high internal consistency ($\alpha=0.87$). Therefore we computed mean scores of the four biospheric value items (Total: $M=5.34$, $SD=1.34$; municipality in the Netherlands: $M=4.57$, $SD=1.34$, $\alpha=0.81$; university in Spain: $M=5.50$, $SD=1.34$, $\alpha=0.90$; public and waste water service provider in Romania: $M=5.55$, $SD=1.18$, $\alpha=0.82$; energy supplier in Italy: $M=5.5$, $SD=1.2$, $\alpha=0.86$); on average, respondents strongly endorsed biospheric values.

2.2.2. Environmental self-identity

We measured environmental self-identity with three items: 'Acting pro-environmentally in an important part of who I am', 'I am the type of person who acts pro-environmentally' and 'I see myself as a pro-environmental person' [58]. Scores on these items could range from 1 (totally disagree) to 7 (totally agree). The environmental self-identity scale showed high internal consistency ($\alpha=0.91$). Therefore we computed the mean score on these items (Total: $M=5.33$, $SD=1.27$; municipality in the Netherlands: $M=4.58$, $SD=1.14$, $\alpha=0.83$; university in Spain: $M=5.13$, $SD=1.26$, $\alpha=0.91$; public and waste water service provider in Romania: $M=5.65$, $SD=1.31$, $\alpha=0.93$; energy supplier in Italy: $M=6.07$, $SD=0.82$, $\alpha=0.81$); on average, respondents indicated that they see themselves as someone who acts pro-environmentally.

2.2.3. Personal norms towards pro-environmental behaviour at work

Personal norms focused on pro-environmental behaviour at work and were measured with 4 items, adapted from Steg and De Groot [45]: 'I feel guilty if I do not act pro-environmentally at work', 'I feel morally obliged to act pro-environmentally at work', 'I feel proud when I act pro-environmentally at work', and 'I would violate my principles if I would not act pro-environmentally at work'. Items were scored on a scale ranging from 1 (totally disagree) to 7 (totally agree). The personal norms scale showed a high internal consistency ($\alpha=0.84$), therefore we computed mean scores of items included in this scale (Total: $M=5.14$, $SD=1.34$; municipality in the Netherlands: $M=4.32$, $SD=1.21$, $\alpha=0.84$; university in Spain: $M=5.17$, $SD=1.31$, $\alpha=0.84$; public and waste water service provider in Romania: $M=5.14$, $SD=1.36$, $\alpha=0.81$; energy supplier in Italy: $M=5.85$, $SD=1.05$, $\alpha=0.85$). This shows that employees' feelings of moral obligation to behave pro-environmentally are rather strong.

2.2.4. Environmental behaviour at work

We aimed to test if the VIP-model predicts different types of environmental behaviours at work. Based on interviews with key persons in the case studies, we identified behaviours over which employees would have control to some extent, although the level of control may vary, for example if employees share their workspace. We included two types of self-reported behaviours which are generally believed to have a positive impact on the environment and two types of self-reported behaviours with a negative impact. More specifically, we selected behaviours related to energy use at the workplace, energy use related to transport, waste prevention and recycling. We followed an impact-oriented definition

of environmental behaviour at work (cf. [23]). More specifically, to assess energy use and environmental impact, we employed a methodology developed by environmental scientists [29], which has successfully been used in earlier studies [1,2,24,33]. We estimated energy use in Mega Joules (MJ; 1 m³ gas = 31.65 MJ and 1 kWh electricity = 10 MJ) associated with employees' behaviour related to energy use at the workplace and energy use related to transport for work purposes (which we refer to as business trips and travelling for work purposes in the questionnaire). Appendix A gives a detailed overview of the calculation method used to assess energy use related to the different behaviours. We assessed the environmental impact associated with the other behaviours (i.e., waste prevention and recycling) by weighing the scores on the behavioural items with their relative environmental impact; this is also further explained in Appendix A.

We assessed *energy use at the workplace* on the basis of 4 items, of which 1 item was an open ended question ('How many hours a day are the lights on at your workspace?') and 3 items were scored on a scale ranging from 1 (never) to 7 (always) ('How often do you have the lights on at your workspace when there is no one in there?', 'How often do you switch the lights off in your workspace when you go home and nobody is left in your workspace?', and 'At work how often do you switch your computer off when you go home?'). Environmental scientists of the Centre of Energy and Environmental Sciences of the University of Groningen (IVEM) assessed energy use at the workplace on the basis of these four items. The Appendix A reveals how the responses on these items were transformed to assess energy use at the workplace (Total: $M = 25.52$ MJ, $SD = 4.52$; municipality in the Netherlands: $M = 27.80$ MJ, $SD = 2.99$; university in Spain: $M = 26.61$ MJ, $SD = 4.83$; public and waste water service provider in Romania: $M = 22.19$ MJ, $SD = 3.08$; energy supplier in Italy: $M = 25.30$ MJ, $SD = 3.85$); higher scores on energy use at the workplace thus reflect a more negative impact on the environment.

Energy use related to transport was assessed by 4 items, of which 1 item was an open ended question ('How many kilometres per week do you on average travel for work by car (business trips)?') and 3 items were scored on a scale ranging from 1 (never) to 7 (always) ('When you travel for work (business trips), how often do you travel by car?', 'When you commute or drive for work purposes (business trips), how often do you drive in an energy efficient way (looking ahead and anticipating on traffic, brake and accelerate quietly, and change to a higher gear as soon as possible)?', and 'When you drive for work (business trips), how often do you carpool rather than drive alone?'). We assessed energy use for transport on the basis of these four items (see Appendix A; Total: $M = 153.36$ MJ, $SD = 427.69$; municipality in the Netherlands: $M = 32.05$ MJ, $SD = 143.78$; university in Spain: $M = 126.73$ MJ, $SD = 369.16$; public and waste water service provider in Romania: $M = 45.86$ MJ, $SD = 97.04$; energy supplier in Italy: $M = 410.85$ MJ, $SD = 698.99$); higher scores reflect more energy use related to transport and a more negative impact on the environment.

Waste prevention was measured with the following 2 item, with scores ranging from 1 (never) till 7 (always): 'At work how often do you read emails from the computer screen rather than printing them?', and 'At work how often do you use as little paper as possible when printing (e.g., 2 pages per paper, two-sided etc.)?'. Environmental scientists from IVEM assessed that using as little paper as possible benefits the environment on average 7.3 times as much than reading emails from the computer screen instead of printing them (see Appendix A). Therefore, we assessed the environmental impact of these behaviours by weighing the scores on the item on using as little paper as possible 7.3 times more than the scores on the item on reading from the computer screen instead of printing before aggregating the scores on both scales. The calculations resulted in a measure for waste prevention on a scale from

1 till 7 (Total: $M = 5.81$, $SD = 1.29$; municipality in the Netherlands: $M = 5.39$, $SD = 1.50$; university in Spain: $M = 6.03$, $SD = 1.15$; public and waste water service provider in Romania: $M = 5.57$, $SD = 1.34$; energy supplier in Italy: $M = 6.06$, $SD = 1.13$); in this case, higher scores reflect acting more pro-environmentally at work.

Recycling was measured with 1 item ('How often do you separate your paper from the regular garbage at work?'), therefore, there was no need to transform the data to assess environmental impact. Scores on this item ranged from 1 (never) tot 7 (always) (Total: $M = 5.75$, $SD = 1.84$; municipality in the Netherlands: $M = 6.22$, $SD = 1.63$; university in Spain: $M = 5.49$, $SD = 2.08$; public and waste water service provider in Romania: $M = 6.09$, $SD = 1.26$; energy supplier in Italy: $M = 5.42$, $SD = 1.95$); a higher score thus means a lower environmental impact related to recycling at work.

3. Results

We tested the VIP-model by conducting a series of regression analysis in which we tested whether each variable predicted the next variable in the model.¹ Also, we tested the expected mediation effects via bootstrapping (following [63]). As expected, stronger biospheric values were associated with a stronger environmental self-identity ($R^2 = 0.34$; $F(1,530) = 273.73$, $\beta = 0.58$, $p < 0.001$). Stronger environmental self-identity, thus the more one sees himself or herself as the kind of person who acts pro-environmentally, was associated with a stronger personal norm to act pro-environmentally at work ($R^2 = 0.63$; $F(1,519) = 883.57$, $\beta = 0.79$, $p < 0.001$). Furthermore, as expected, environmental self-identity mediated the relationship between biospheric values and personal norms to behave pro-environmentally at work. The mean indirect effect from the bootstrap analysis with 1000 resamples derived from the full sample was positive and significant ($a \times b = 0.39$). The bias-corrected bootstrap estimate of the indirect effect had a 95% confidence interval ranging from 0.33 to 0.45. In the indirect path, a unit increase in biospheric values increased environmental self-identity by $a = 0.51$. Holding biospheric values constant, a unit increase in environmental self-identity increased personal norms to behave pro-environmentally at work by $b = 0.76$. The direct effect ($c = 0.50$) of biospheric values on personal norms to behave pro-environmentally at work is also positive and significant ($p < 0.001$). Holding environmental self-identity constant, a unit increase in biospheric values increased personal norms by $c = 0.11$. This implies that there is complementary mediation [63], which means that biospheric values affected personal norms to act pro-environmentally at work both directly as well as indirectly via environmental self-identity.

Next, we tested whether personal norms predicted the four different types of environmental behaviour at work. As expected, stronger personal norms increased the likelihood of engaging in different types of pro-environmental behaviours at work and decreased the likelihood of engaging in environmental

¹ Although the mean scores on the key variables varied across the different organizations in the different countries, we found the same pattern of results when looking at the relationships between variables in the VIP-model for the different organizations. We looked at the extent to which the 95% confidence intervals (CI) for the standardized regression coefficients overlap between the different case study organizations. The results indicate that the 95% CI show overlap and are generally similar. Only for the direct effect of personal norms on behaving pro-environmentally on transport related energy use (Municipality of Groningen: $\beta = -0.28$ with a 95% CI ranging from -57.35 to -9.72 ; Aquatim: $\beta = 0.12$ with a 95% CI ranging from -5.59 to 22.21) and for the direct effect of personal norms on recycling (Municipality of Groningen: $\beta = 0.10$ with a 95% CI ranging from -0.14 to 0.40 ; University of A Coruna: $\beta = 0.37$ with a 95% CI ranging from 0.39 to 0.84) we saw that the 95% CI of the regression coefficients did not overlap strongly. For the full model all 95% CI for the standardized regression coefficients overlapped to a great extent. Therefore we tested the model including the full dataset.

behaviours with a negative impact. More specifically, regression analysis revealed that stronger personal norms to behave pro-environmentally at work were associated with lower energy use at the workplace ($R^2=0.02$; $F(1,391)=8.60$; $\beta=-0.15$, $p<0.01$), although the effect was weak. Against our expectation, stronger personal norms to behave pro-environmentally at work were weakly and positively associated with a higher transport related energy use ($R^2=0.01$; $F(1,485)=5.08$; $\beta=0.10$, $p=0.03$). This is an interesting finding, because it suggests that people with stronger personal norms to behave pro-environmentally at work behave less pro-environmentally with regard to transport than people who do hold weaker personal norms; we come back to this issue in the discussion. Yet, it could be that employees have limited control over the amount of kilometres they need to travel for work purposes. Therefore, we also looked at environmental impact of behaviour related to transport excluding the amount of kilometres driven for work purposes (see [Appendix A](#)). In this case, a higher score on this scale reflects more energy savings related to transport (i.e., a better pro-environmental performance). This time, in line with our expectations, personal norms to act pro-environmentally at work predicted energy savings related to transport positively: stronger personal norms to act pro-environmentally at work were related to higher energy savings related to transport ($R^2=0.04$; $F(1,429)=18.20$; $\beta=0.20$, $p<0.001$). Stronger personal norms to behave pro-environmentally were also significantly and positively associated with waste prevention at work ($R^2=0.08$; $F(1,486)=44.23$; $\beta=0.29$, $p<0.001$). Finally, personal norms to act pro-environmentally at work were positively related to recycling at work: the stronger the personal norms to behave pro-environmentally at work, the more employees recycled ($R^2=0.04$; $F(1,488)=20.05$; $\beta=0.20$, $p<0.001$).

As a final step, we conducted double-mediation analyses to further test the causal relationships in the VIP-model for the different types of behaviour.² We found support for the full model when waste prevention was the dependent variable (see [Table B4](#) in [Appendix B](#)). The mean indirect effect of biospheric values on waste prevention was positive and significant ($A1 \times b21 \times b2=0.06$). This bias-corrected bootstrap estimate of the indirect effect (with 1000 resamples derived from the full sample) had a 95% confidence interval ranging from 0.01 to 0.11. This suggests that the more people value the environment, the more they see themselves as the kind of person who behaves pro-environmentally, which was in turn strengthens their feelings of moral obligation to behave pro-environmentally at work, which finally promoted their waste prevention behaviour at work. Besides, the direct effect of biospheric values on waste prevention behaviour was also significant ($c'=0.12$; $p<0.01$), suggesting that stronger biospheric values were also directly associated with more waste prevention behaviour at work, and not solely via environmental self-identity and personal norms. The mediation effects in the VIP-model were not supported for the other three dependent variables: recycling, energy use at the workplace and transport related behaviour (energy use related to transport and energy saving related to transport; see [Tables B1–B3 and B5](#) in [Appendix B](#)).³

² We present the results from bootstrapping double-mediation analyses, but we found the same pattern of result via Structural Equation Modelling (SEM). Results of the SEM can be obtained from the first author.

³ The additional qualitative interviews among employees at different levels in the four organizations showed that there are different factors that are likely to affect the likelihood that employees translate their personal norms into environmental behaviour at work. The results first suggest that structural barriers and a lack of control over the behaviours inhibit employees to act upon their personal norms, for example that sharing an office reduces control over turning off lights. Another reason was that some behaviours were perceived to be too effortful. The last main reason mentioned was more personal and mentioned by a few people only, for example a

4. Discussion

Pro-environmental behaviour reflects behaviour that harms the environment as little as possible or even benefits it. Thus far, little is known about environmental behaviour at work and which individual factors motivate such behaviour. As encouraging pro-environmental behaviour at the workplace can result in a significant reduction in environmental problems, it is important to better understand which factors affect pro-environmental behaviour at work. This may provide important insights in how such behaviour may be (further) promoted.

We were interested in whether we could identify general factors that affect pro-environmental behaviour at work, and via which processes these factors affect such behaviour. More particularly, we tested the VIP-model to examine to what extent and how environmental considerations, and more particularly biospheric values and environmental self-identity, predict pro-environmental behaviour at work. The VIP-model is a novel parsimonious theoretical framework integrating value theory, identity theory and theories on personal norms, building on research on pro-environmental behaviour at home. This VIP-model suggests that biospheric values and environmental self-identity influence one's personal norms to behave pro-environmentally at the workplace, which in turn affects different types of pro-environmental behaviour at work. The VIP-model is a more parsimonious model than the VBN theory and includes mostly general factors, and is therefore more likely to predict many different types of environmental behaviours at work.

We conducted a questionnaire study among a wide sample of employees from different public and private organizations in Europe, and found that biospheric values were indeed positively related to personal norms, thus feelings of moral obligation to behave pro-environmentally at work. As expected, the relationship between biospheric values and personal norms to behave pro-environmentally at work was partially mediated by environmental self-identity. These results suggest that people with strong biospheric values have a stronger environmental self-identity, which in turn strengthens their feelings of moral obligation to behave pro-environmentally at work. These results suggest that general environmental considerations (in this case biospheric values and environmental self-identity) are indeed an important source for people's personal norms to behave pro-environmentally at work, explaining a substantial proportion of the variance in personal norms, similarly as for personal norms to behave pro-environmentally at home. Also, the results suggest that in general people report that they have strong personal norms to behave pro-environmentally at work. This is an important finding, suggesting that employees feel morally obliged to act pro-environmentally at work and thus seem not to deny the importance of engaging in pro-environmental actions at the workplace.

Moreover, our research shows that when employees have strong personal norms to behave pro-environmentally at work, they are somewhat more likely to use less energy at the workplace, to engage in energy saving behaviour related to transport, to engage in waste prevention behaviour, and to recycle more. Yet, relationships between personal norms and environmental behaviour at work were not very strong. Probably, employees perceive barriers to act upon their feelings of moral obligation to behave pro-environmentally at work. Indeed, additional qualitative interview²

tension between an employee and the organization resulting in the unwillingness of the employee to save energy because this would reduce economic costs for the organization. Hence, the qualitative interviews suggest that structural barriers and a lack of control over behaviours could prevent employees from translating their personal norms to behave pro-environmentally at work into environmental behaviour at work.

revealed that some employees indicated that they would more often engage in pro-environmental actions at work when the organization would create the right conditions for acting upon their feelings of moral obligation, by securing sufficient autonomy and control over pro-environmental behaviour. For transport related behaviour we even found that stronger personal norms to behave pro-environmentally at work were only related to less energy use or more pro-environmental behaviour when the amount of kilometres employees need to travel for work purposes were not included in the measure of transport-related energy use, probably because they have little control over the need to make these trips. This suggests that the (organizational) context can sometimes seriously inhibit pro-environmental behaviour at work, making it less or even impossible for workers to act upon their pro-environmental personal norms. For example, specific tasks related to employees' job position (i.e., the need to drive long distances for work purposes) can necessitate workers to engage in behaviour with a high environmental impact, even though they would prefer otherwise; further research is needed to investigate this reasoning. Clearly, in such cases, strong personal norms are not sufficient to encourage pro-environmental actions at work. If this reasoning is correct, employees may be more likely to act upon their feeling of moral obligation to behave pro-environmentally at work if they are facilitated to do so. Research on pro-environmental behaviour in the private sphere also shows that people do not always act upon their personal norms, especially when this behaviour is perceived as too costly, when people perceive significant barriers for doing so or when environmental behaviour is habitual [5,48]. This implies that it is important to study how we can create contexts at work that facilitate or at least do not inhibit pro-environmental choices, so that people are (better) able to act more upon their personal norms to behave pro-environmentally at work.

How should such a facilitating context look like? A context characteristic that may inhibit workers to act upon their feelings of moral obligation to behave pro-environmentally at work might be a perceived lack of autonomy or a lack of possibilities to behave pro-environmentally. Additional semi-structured interviews with multiple key persons from the different case study organizations (i.e., actors at different levels in the organization that are likely to have different views and perspectives on the issues at stake²) indeed revealed that structural factors may strongly affect energy-related behaviour at work. For example, sharing an office with a colleague or centralized heating systems diminished the control over turning off lights and heating, preventing those who care about saving energy to actually do so. Also, production processes (characteristics of the work itself) may inhibit pro-environmental behaviour at work, such as the need to travel to external locations that lack appropriate public transportation. Such structural barriers may strongly affect employees' control over their pro-environmental behaviour at work, and their possibility to act upon their feelings of moral obligation to behave pro-environmentally at work. A facilitating context could thus first be created by removing such structural barriers, for example by creating or facilitating environmentally friendly behavioural alternatives (e.g., the provision of good public transportation, facilitating virtual meetings, or the possibility to carpool with colleagues). A next step could be to remove the possibility for environmental behaviour with a harmful impact. Yet, a facilitating context is more than forcing employees to behave pro-environmentally. If there are behaviours that employees want to do, because they feel morally obliged to do so, a facilitating context could increase employees' feeling of autonomy over their own environmental behaviours by giving them the choice (e.g., every employee has control over their own lighting), which may in turn strengthen their environmental self-identity, which can promote subsequent pro-environmental actions [59]. Future research is needed to investigate the possible negative or

positive impact of structural factors on the influence of personal norms on pro-environmental behaviour at work. Future research could also compare to what extent the VIP-model predicts similar behaviour at work and at home and investigate which factors can explain possible differences in explanatory power.

Another important characteristic of the organizational context is the focus on profit generation [39]. As a consequence, the organizational context may comprise different signs indicating the organizations' main concern for economic profitability, such as reward systems on the basis of annual profitability, short and long-term strategies focused on profit generation, and outcomes measured in profit ratios. Such contextual factors are likely to increase the likelihood that employees focus on enhancing resources and minimizing costs rather than on improving environmental quality [44]. However, there is a growing interest among organizations to become more "green" [26,30]. A strong emphasis of becoming green may increase the likelihood that factors in the organizational context, such as environmental management practices, promotion of environmental initiatives, and clear monitoring systems of environmental impact, can all communicate that employees and organizations care for and respect the environment [11,15,38]. This may in turn increase the likelihood that people act upon their biospheric values, environmental self-identity and personal norms, making these factors more influential of pro-environmental behaviour at work [13]. Future research is needed to investigate this possible relationship between different factors in the organizational context and the predictive power of the VIP model to explain pro-environmental behaviour at work.

A third important characteristic of the organizational context is the high demands on self-control in organizations [39]. Prolonged claims on self-control by high cognitive load due to work-related behaviour can result in a temporary reduction in self-control [6,35]. As pro-environmental behaviour at work is generally more costly in the sense of comfort or effort, one probably requires a certain level of self-control to counter the impulse or urge to aim for easiness or comfort. Therefore, a reduced level of self-control is likely to weaken employees' focus on acting appropriately, and strengthens employees' focus on non-environmental consideration. This implies that in case of low self-control, workers may be less likely to act upon their personal norms to behave pro-environmentally at work when these behaviours are rather effortful. Future research is needed to test the effects of reduced levels of self-control on pro-environmental behaviour at work, for example by investigating employees' pro-environmental behaviour when they encounter reduced levels of self-control after a long workday or an effortful task.

An important finding in our research was that biospheric values were not only indirectly, but also directly related to one of the types of pro-environmental behaviour at work when environmental self-identity and personal norms were controlled for. We could argue that the process behind this direct effect could be more automatic, which would suggest that workers more or less automatically act upon their biospheric values. As values reflect what people see as a guiding principle in their life, values can function as a simple decision rule in some cases. For people with strong biospheric values, pro-environmental behaviour could be the default option when the behaviour is not too costly. Future research is needed to investigate this reasoning.

4.1. Limitations

Certain limitations of the current research need to be kept in mind when interpreting the results. In our research we have used single source self-reported data. Although this is a common approach it has been criticized by some scholars. This is mainly due to the potential that individuals are likely to present them-

selves somewhat consistently and somewhat favourably. In this research we were not able to control for social desirability. Besides, the method for calculation environmental impact related to environmental behaviour at work was developed in collaboration with IVEM environmental scientists, which has been successfully employed in previous studies. Yet, we relied on impact indicators of the Netherlands, and did not employ specific environmental impact data for the four different case study organizations separately. Future research should consider including more precise measures such as actual records of energy use, for example via smart plugs. Also, for the data collection we relied on the collaboration with the participating organizations. The participants were recruited via an e-mail that was sent by a staff member of the organization (our contact person) to all employees of the organization or the division we contacted, therefore we did not have full control over the recruitment process and do not know the number of employees that have been contacted or declined to participate.

Besides, our research findings are based on correlational data and we cannot rule out the possibility of order effects and the possibility of some other causal relations. This particularly concerns the relationship between environmental self-identity and behaviour. Notably, research [58,59] has shown that environmental self-identity not only depends on biospheric values, but also on one's previous environmental actions. For example, reminding individuals of their past pro-environmental behaviours positively influenced their environmental self-identity. This suggests that the self-reported environmental behaviours could have positively influenced the environmental self-identity as well, reflecting dynamic relationships in which environmental self-identity and past environmental behaviour influence each other. In the questionnaire, we did measure self-reported environmental behaviour after the questions on environmental self-identity, decreasing the likelihood that responses on the environmental self-identity questions were influenced by reminding respondents of their past environment behaviour. Yet, future research could employ different research designs, including experimental studies, to test causal relationships more thoroughly.

In this research the organizational factors (context characteristics) were not studied. Such organizational factors can affect the relationships between variables in the VIP model in important ways. Future studies could examine which contextual factors affect the likelihood that biospheric values, environmental self-identity and personal norms predict different types of pro-environmental behaviour at work. Research on pro-environmental behaviour in the private sphere indicates that personal norms are less likely to be translated into behaviour when such behaviour is rather costly (see Ref. [48] for a review). Our current research does provide guidance for which contextual factors are potential important for pro-environmental behaviour at work. Future research is needed to (experimentally) study the extent to which and how relevant organizational factors influence the extent to which the VIP model explains pro-environmental behaviour at work. Future research could also compare the predictive power of the VIP-model in explaining similar behaviours at work and at home.

4.2. Practical implications

The findings of the present study are not only theoretically interesting, but also of practical relevance. Many organizations employ external incentives and sanctions to stimulate pro-environmental behaviour at work [25,53]. Although organizations could rely on sanctions to stimulate pro-environmental behaviour, enforcement of such sanctions is generally difficult and expensive, or even not possible. Therefore, it is important to study to what extent environmental considerations influence pro-environmental behaviour at work, because this route to pro-environmental behaviour could

be a cost-efficient way to promote pro-environmental behaviour, as no external incentives, such as financial rewards, may be needed. Therefore, our finding that feelings of moral obligation to act pro-environmentally at work were rather strong in the organizations studied is very important from a practical point of view. Also, our study reveals that the extent to which employees feel morally obliged to behave pro-environmentally at work is influenced by general environmental considerations (i.e., biospheric values and environmental self-identity), which implies that personal norms can be (further) strengthened by targeting these factors [58,59]. Therefore, it is all the more important to understand how policymakers and organizations can make better use of employees' personal norms in promoting pro-environmental behaviour at work. Yet, a key issue to consider here is how employees can be encouraged to act upon their (strong) personal norms to act pro-environmentally at work, for example by communicating, demonstrating and facilitating the relevant actions.

Also of practical relevance is that strong personal norms seem to encourage different types of pro-environmental behaviour to some extent. When considering the aggregate effects of these actions, this may have a significant effect on environmental quality. Importantly, when an organization wants to promote pro-environmental behaviour among its employees, it would be more effective if an intervention does not solely lead to the adoption of the specific targeted behaviour, but also to other pro-environmental behaviours. Targeting general antecedents may affect different behaviours at once [59]. By targeting biospheric values and environmental self-identity, it is more likely that people engage in many different pro-environmental behaviour over and over again, which is needed for sustainable development. As our model predicted different types of pro-environmental behaviours, it is likely that personal norms to behave pro-environmentally at work could promote such positive effects, provided that no serious barriers are present that inhibit such behaviour; further research is needed to test this.

4.3. Conclusion

In sum, our research highlights the importance of general environmental considerations (i.e., biospheric values and environmental self-identity) on employees' personal norms to behave pro-environmentally at the workplace. Our research suggests that the VIP-model yields promising, cost-efficient yet at the moment unused strategies to encourage pro-environmental behaviour at work, as understanding ways to make people act more upon their personal norms to behave pro-environmentally at work would mean that external incentives (e.g. financial rewards) may not be needed to promote pro-environmental behaviour at work. An important next question is how to design facilitating contexts, which can encourage people to act more upon their personal norms to behave pro-environmentally at work.

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Appendix A.

We consulted environmental scientists from the IVEM to assess the environmental impact of the behaviours included in our study, as we were interested in the environmental impact of behaviour at work, and hence the environmental performance of workers. The environmental scientists based their environmental impact assessments on input-output analysis, which has successfully been employed in previous studies (e.g., [7,8,32]). Further details can be obtained from the first author.

Estimations of energy use at the workplace.

Table A1 below shows the estimates of energy use in mega joule (MJ) associated with employees' behaviour related to energy use at the workplace, provided by the environmental scientists. The estimations reflect energy use per week in MJ per person.

Table A1

Estimation of energy use at the workplace (MJ).

Lighting	
How many hours a day are the lights on at your workspace?	Hours a day the lights are on × 1.44 MJ
How often do you have the lights on at your workspace when there is no one there?	
1 (never)	−0.20 × (hours a day the lights are on × 1.44 MJ)
2	−0.17 × (hours a day the lights are on × 1.44 MJ)
3	−0.13 × (hours a day the lights are on × 1.44 MJ)
4	−0.10 × (hours a day the lights are on × 1.44 MJ)
5	−0.07 × (hours a day the lights are on × 1.44 MJ)
6	−0.03 × (hours a day the lights are on × 1.44 MJ)
7 (always)	−0.00 × (hours a day the lights are on × 1.44 MJ)
How often do you switch the lights off in your workspace when you go home and nobody is left in your workspace?	
1 (never)	1.08 MJ
2	0.90 MJ
3	0.72 MJ
4	0.54 MJ
5	0.36 MJ
6	0.18 MJ
7 (always)	0.00 MJ
Computer	
Do you use a computer at work?	
No	0.00 MJ
Yes	18.36 MJ
At work how often do you switch your computer off when you go home?	
1 (never)	33.48 MJ
2	27.90 MJ
3	22.32 MJ
4	16.74 MJ
5	11.16 MJ
6	5.58 MJ
7 (always)	0.00 MJ
Estimation of total energy use at the workplace (MJ)	Sum of the outcomes above

Estimations of transport related energy use.

Table A2 shows the estimates of energy use in mega joule (MJ) associated with employees' energy use related to transport, provided by environmental scientists. The estimations reflect energy use per week in MJ per person. In Table A2 we refer to the item 'How many kilometres per week do you on average travel for work by car (business trips)?' as 'Amount of km travelled by car'.

Environmental impact of energy savings related to transport.

Environmental scientists assessed transport related energy savings on the basis of the 2 of the transport behaviour items described earlier (i.e., 'When you commute or drive for work purposes, how often do you drive in an energy efficient way (looking ahead and anticipating on traffic, brake and accelerate quietly, and change to a higher gear as soon as possible)?', and 'When you drive for work, how often do you carpool rather than drive alone?'). Environmental scientists estimated that carpooling reduces energy use 5 times as much as does an energy efficient driving style. Therefore, we calculated environmental impact due to energy savings related to these behaviour by multiplying scores on the item on carpooling with 5 before adding the scores on energy efficient driving style. The calculations resulted in a measure for transport related energy saving on a scale from 1 till 7 ($M=3.35$, $SD=1.86$); a higher score on this scale reflects a lower environmental impact with regard to these transport behaviours (i.e., a higher pro-environmental performance).

Environmental impact of waste prevention.

Environmental scientists estimated the environmental impact of waste prevention behaviour. They estimated that using as little paper as possible when printing results in a 7.3 times lower environmental impact than reading e-mails from the computer screen.

Table A2

Estimation of energy use related to transport (MJ).

Items for energy use related to transport	
When you travel for work (business trips), how often do you travel by car?	
1 (never)	$0.00 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
2	$0.17 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
3	$0.33 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
4	$0.50 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
5	$0.67 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
6	$0.83 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
7 (always)	$1.00 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
When you commute or drive for work purposes, how often do you drive in an energy efficient way (looking ahead and anticipating on traffic and brake and accelerate quietly and change to a higher gear as soon as possible)?	
1 (never)	$-0.00 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
2	$-0.02 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
3	$-0.03 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
4	$-0.05 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
5	$-0.07 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
6	$-0.08 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
7 (always)	$-0.10 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
When you drive for work, how often do you carpool rather than drive alone?	
1 (never)	$-0.00 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
2	$-0.08 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
3	$-0.17 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
4	$-0.25 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
5	$-0.33 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
6	$-0.42 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
7 (always)	$-0.50 \times (\text{Amount of km travelled by car} \times 2.60 \text{ MJ})$
Estimation of total energy use related to transport (MJ)	Sum of the outcomes above

Therefore, we calculated environmental impact due to waste prevention behaviour by multiplying scores on the item on using as little paper as possible when printing (“At work how often do you use as little paper as possible when printing (e.g., 2 pages per paper, two-sided etc.)?”) with 7.3 before adding the scores on reading e-mails from the computer screen (“At work how often do you read emails from the computer screen rather than printing them?”). The calculations resulted in a measure for waste prevention on a scale from 1 till 7 ($M = 5.81$, $SD = 1.29$); higher scores reflect acting more pro-environmentally at work.

Appendix B. Supplementary results

Table B1

Double-mediation analyses to test the VIP-model for Energy use at the workplace.

	Model Path Estimates			
	Coeff	SE	t	
Effect $X \rightarrow M_1$	0.55***	0.04	13.56	
Effect $X \rightarrow M_2$	0.13***	0.04	3.49	
Effect $M_1 \rightarrow M_2$	0.73***	0.04	18.76	
Effect $M_1 \rightarrow Y$	-0.67*	0.30	-2.22	
Effect $M_2 \rightarrow Y$	0.39	0.28	1.37	
Effect $X \rightarrow Y - M_1 M_2$	-0.38	0.220	-1.76	
Indirect Effects				
	Effect	Boot SE	LL 95% CI	UL 95% CI
Total	-0.16	0.14	-0.44	0.10
$X \rightarrow M_1 \rightarrow Y$	-0.37	0.16	-0.68	-0.07
$X \rightarrow M_2 \rightarrow Y$	0.05	0.04	-0.01	0.16
$X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$	0.16	0.12	-0.07	0.42

X = Biospheric values. M_1 = Environmental self-identity. M_2 = Personal norms towards pro-environmental behaviour at work. Y = Pro-environmental behaviour at work.

* $p < 0.05$.

*** $p < 0.001$ (2-tailed).

Table B2

Double-mediation analyses to test the VIP-model for Transport related energy use (MJ).

	Model Path Estimates			
	Coeff	SE	t	
Effect $X \rightarrow M_1$	0.55***	0.04	15.17	
Effect $X \rightarrow M_2$	0.13***	0.03	3.74	
Effect $M_1 \rightarrow M_2$	0.76***	0.04	21.38	
Effect $M_1 \rightarrow Y$	9.11	26.08	0.35	
Effect $M_2 \rightarrow Y$	41.12	24.03	1.71	
Effect $X \rightarrow Y - M_1 M_2$	-28.97	18.44	-1.57	
	Indirect Effects			
	Effect	Boot SE	LL 95% CI	UL 95% CI
Total	27.47	9.31	-65.21	7.27
$X \rightarrow M_1 \rightarrow Y$	5.02	10.52	-15.11	26.76
$X \rightarrow M_2 \rightarrow Y$	5.29	3.16	0.55	13.41
$X \rightarrow M1 \rightarrow M2 \rightarrow Y$	17.15	9.19	-0.69	34.97

X = Biospheric values. M_1 = Environmental self-identity. M_2 = Personal norms towards pro-environmental behaviour at work. Y = Pro-environmental behaviour at work.

*** $p < 0.001$ (2-tailed).

Table B3

Double-mediation analyses to test the VIP-model for Transport related energy savings.

	Model Path Estimates			
	Coeff	SE	t	
Effect $X \rightarrow M_1$	0.58 ^{***}	0.04	14.89	
Effect $X \rightarrow M_2$	0.13 ^{***}	0.04	3.51	
Effect $M_1 \rightarrow M_2$	0.75 ^{***}	0.04	19.78	
Effect $M_1 \rightarrow Y$	0.26 [*]	0.12	2.22	
Effect $M_2 \rightarrow Y$	0.05	0.11	0.46	
Effect $X \rightarrow Y - M_1 M_2$	0.07	0.09	0.80	
Indirect Effects				
	Effect	BootSE	LL 95% CI	UL 95% CI
Total	0.18	0.05	0.08	0.28
$X \rightarrow M_1 \rightarrow Y$	0.15	0.07	-0.00	0.29
$X \rightarrow M_2 \rightarrow Y$	0.01	0.02	-0.02	0.15
$X \rightarrow M1 \rightarrow M2 \rightarrow Y$	0.02	0.05	-0.08	0.12

X = Biospheric values. M₁ = Environmental self-identity. M₂ = Personal norms towards pro-environmental behaviour at work. Y = Pro-environmental behaviour at work.

* p < 0.05.

*** p < 0.001 (2-tailed).

Table B4

Double-mediation analyses to test the VIP-model for waste prevention.

	Model Path Estimates		
	Coeff	SE	t
Effect $X \rightarrow M_1$	0.49***	0.03	15.50
Effect $X \rightarrow M_2$	0.12***	0.03	3.93
Effect $M_1 \rightarrow M_2$	0.75***	0.04	21.35
Effect $M_1 \rightarrow Y$	0.07	0.07	0.93
Effect $M_2 \rightarrow Y$	0.15*	0.07	2.21
Effect $X \rightarrow Y - M_1 M_2$	0.12**	0.05	2.65
	Indirect Effects		
	Effect	Boot SE	LL 95% CI
Total	0.11	0.03	0.05
$X \rightarrow M_1 \rightarrow Y$	0.03	0.04	-0.05
$X \rightarrow M_2 \rightarrow Y$	0.02	0.01	0.00
$X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$	0.06	0.03	0.01
			UL 95% CI
			0.17
			0.11
			0.04
			0.11

X = Biospheric values. M₁ = Environmental self-identity. M₂ = Personal norms towards pro-environmental behaviour at work. Y = Pro-environmental behaviour at work.

* p < 0.05.

** p < 0.01.

*** p < 0.001 (2-tailed).

Table B5

Double-mediation analyses to test the VIP-model for Recycling.

	Model Path Estimates			
	Coeff	SE	t	p
Effect X → M ₁	0.49***	0.03	15.53	<0.001
Effect X → M ₂	0.12***	0.03	4.02	<0.001
Effect M ₁ → M ₂	0.75***	0.04	21.14	<0.001
Effect M ₁ → Y	0.22*	0.11	2.00	<0.05
Effect M ₂ → Y	0.10	0.10	1.02	0.31
Effect X → Y – M ₁ M ₂	0.01	0.07	0.21	0.83
Indirect Effects				
Effect	Boot SE	LL 95% CI	UL 95% CI	
Total	0.16	0.05	0.06	0.26
X → M ₁ → Y	0.11	0.07	–0.03	0.23
X → M ₂ → Y	0.01	0.02	–0.01	0.05
X → M ₁ → M ₂ → Y	0.04	0.04	–0.04	0.13

X = Biospheric values. M₁ = Environmental self-identity. M₂ = Personal norms towards pro-environmental behaviour at work. Y = Pro-environmental behaviour at work.

* p < 0.05.

*** p < 0.001 (2-tailed).

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